

Remarks / Arguments

Preliminarily, the reasons for the changes in applicants' claims as submitted herein are provided. In particular, in the first element of claim 1, it is noted that the printed circuit board is now described as having a first and second side. This could also have been referred to as a "top side" and a "bottom side." However, since the orientation of the printed circuit board is irrelevant to the operation or scope of applicants' claimed invention, the terms "first side" and "second side" are used instead. It is also indicated that the printed circuit board includes a circuit board edge connector. This is slightly more in keeping with the language found in applicants' specification. However, it is noted that the deletion of the term "electrical" is not meant to imply that electrical connections are not intended to be made by this connector. Those of ordinary skill in the art clearly understand what a circuit board edge connector is and what its function is. It is further noted that reference to a circuit board having a first side and second side also makes it easier to refer to other elements and their positions with respect to the circuit board later on in the claim. It is also noted that applicants' first claim element now specifically recites the inclusion of at least one printed circuit card connector which is disposed on the first side of the printed circuit board. This is fully in keeping with the recitation found in applicants' preamble to the phrase "printed circuit cards." The remaining modifications found in the second and third elements of applicants' claim 1 have been made to make them consonant with the recitations found in the currently submitted first element of claim 1.

It is applicants' position that both the newly submitted claims and the originally presented claims are directed to what is essentially a three-layered sandwich structure in which the

5 "meat" is a printed circuit board and the bread slices that surround the "meat" are two different slices of bread, namely, a slice of white bread in the form of a stiffener and on the other side of the "meat," one finds a slice of rye bread in the form of a non-conductive base.

As pointed out in applicants' specification, the purpose of applicants' invention is to meet several competing objectives with respect to the design of printed circuit boards. In particular, the claimed printed circuit board assemblies are designed to be removable whether or not printed circuit cards are already in place on the board and whether or not they are already in electrical connection with circuit board wiring. Because of the relatively large size of the board, it is also desirable to protect against what applicants have described as a flexing or "oil-canning" distortion of a printed circuit board, particularly one that has a large area and one which is particularly heavily laden with printed circuit cards already in place. In this respect, it is to be particularly noted that, in applicants' invention, it is the intention that printed circuit cards be disposed within cartridges which are easily inserted and removed, independently of whether or not the printed circuit board is connected to an external chassis or frame. Accordingly, to avoid flexing and oil-canning effects, applicants have provided the recited stiffener which is disposed on the side of the circuit board which contains the printed circuit card connectors, that is, on the "first" side. However, there is more to the claimed structure as seen by the fact that applicants have also included a recitation directed to a non-conductive base. This base is provided as a mechanism against which force may be exerted to achieve insertion and removal of the entire board itself. The non-conductive base structure is not precluded from providing its own degree of stiffening enhancement with respect to the printed circuit board. However, it is noted that the presence of the

stiffener, particularly where it is disposed (on the side of the board with typically many more exposed electrical connections), provides an additional mechanism (as is recited in applicants' claims 2, 4, 7, and 8) directed to providing electromagnetic interference (EMI) shielding in the claimed invention. In this regard, it is also to be particularly noted that it is another one of applicants' objectives to provide printed circuit board assemblies for circuits and systems which are dense in terms of the number of electrical components per square inch and which operate at high frequency.

Additional modifications have been made to claim 5 for the purpose of pointing out that the recited guide slots are not only substantially parallel to the printed circuit board, but that they are also substantially parallel to one another. A non-limiting whereby clause is also included in the modifications made to claim 5 to more particularly point out the purpose of the guide slots and to put this aspect of the invention in context with the overall cartridge, card, and board system. The modification to claim 6 points out that, in one embodiment of the present invention, the guides are present in the form of a monolithic molded polymer structure. Support for this modification is found within applicants' specification. Claim 7, 8, and 9 are added by the present amendment to more particularly point out and claim further patentable aspects of the invention.

Attention is now directed to the specific consideration of the rejection of applicants' claims 1-6 under 35 U.S.C. § 103 based upon the patent to Lajara et al. in view of the patent to Jackson et al. In this regard, attention is first focused on what has been pointed out above as being a succinct description of applicants' invention as being in the form of a three-layered sandwich with a printed circuit board in the middle and on one side of which is a non-conductive base and on the other side of

which is a stiffener which can also provide EMI shielding. Accordingly, applicants' invention can be described succinctly as a stiffener disposed on a printed circuit board disposed on a non-conductive base. Furthermore, it is seen that, in
5 applicants' claimed invention, the first side of the printed circuit board (the stiffener side) includes at least one printed circuit card connector. In addition to providing stiffening properties, the stiffener may also be described as being
10 shielding. Furthermore, the recited base provides a solid structure against which insertion forces for the entire board may be exerted.

Having thus characterized applicants' invention as described above, it is important to note that the teachings of Lajara et
15 al. are inconsonant with respect to the claimed invention. In particular, it is seen that Lajara et al., to the extent that they disclose a stiffener structure, dispose this structure on the second or bottom side of the printed circuit board. In other words, Lajara et al. dispose their stiffener on the side of their
20 printed circuit board with is opposite to the side on which their printed circuit card connectors are disposed. In contrast, the applicants' claimed teachings are to the opposite, namely, that of providing a stiffener on the same side of the circuit board as the printed circuit card connectors. This enables stiffeners
25 which are made of metal or other conductive materials to act as electromagnetic interference shields for the entire circuit board. In this regard, attention is specifically directed to column 5, lines 65 through column 6, line 2 of the patent to Lajara et al.:

30 "As noted earlier, the stiffener may serve as the 'backbone' of the motherboard 40 that is carrying densely packed electronic circuitry

and components. The motherboard 40 is mounted on the chassis 24 with the stiffener (not visible in FIG. 2) as the mounting vehicle."

5 In this regard attention is specifically directed to Figures 1A and 1B. Attention is also directed to column 6, lines 31-44, in Lajara et al. who state in relevant part:

10 "The foregoing discloses a stiffener design that provides back plane support for a printed circuit board, e.g., a motherboard, and lies between the circuit board and the wall of the chassis on which the circuit board is being mounted." [Emphasis added herein.]

15 Accordingly, it is seen that Lajara et al. teach a structure which is fundamentally different from that claimed. In particular, Lajara et al. teach a structure in which the stiffener is taught as being disposed on the bottom, lower, or second side of the printed circuit board, that is, on a side of
20 the board opposite to the side on which printed circuit card connectors are disposed. Applicants' claimed invention is clearly directed in the opposite direction. For this reason alone, the deficits of Lajara et al. cannot be remedied. Accordingly, those skilled in the art who follow the directions
25 of Lajara et al. would not be led to construct printed circuit board structures in which stiffeners are disposed on upper surfaces thereof, that is, they would not be led to deploy a stiffener disposed on the same side of a printed circuit board as its printed circuit card connectors.

Furthermore, the Examiner has already admitted that the patent to Lajara et al. does not disclose a non-conductive base. However, to supplant this deficiency found in the teachings of Lajara et al., the Examiner draws upon the teachings found in the newly cited patent to Jackson et al. In this regard, the Examiner indicates that the patent to Jackson et al. refers to an insulative base 244. However, as is shown in column 11, line 35, of the patent to Jackson et al., reference numeral 244 is directed to standoffs, not to a base. There is no non-conductive base taught by Jackson et al. The other structures which the Examiner refers to as being present in Jackson et al. are a circuit board 200 described therein as a "motherboard" and a host board 210. Clearly, these two structures are printed circuit boards. Neither is a base or a stiffener. Furthermore, even if one were to interpret the standoffs in Jackson et al. as being a non-conductive base, it is clear that the teachings of Jackson et al. are that this "base" is disposed between two printed circuit structures: a host board and a motherboard. Such structures are clearly different than the claimed invention.

The Examiner further indicates that, in his opinion, it would have been obvious to provide an insulative base in the device of Lajara et al. to prevent short circuits. There are two things wrong with this argument. The first is that if one were to provide an insulative base similar to applicants' claimed base in the device shown in Lajara et al., it is the Examiner's position that this insulative base material would be disposed between the circuit board and the stiffener taught by Lajara et al. If this were the case, the resulting structure would not be one in which a printed circuit board is the centerpiece of a three-layered sandwich structure. As to the second error in this argument, it is noted that there is no reason for this teaching apart from that which is found in applicants' specification. In particular, it is noted that Lajara et al. specifically do

indicate that their stiffening structure comprises a metal. As such, it would be conductive. However, it appears that the printed circuit board found in Lajara et al. does not require insulative stiffener material since it would appear that Lajara
5 et al. do not contemplate exposed conductive wiring or attachment positions on the underside of their printed circuit board.

Accordingly, for all of the reasons indicated above, it is clear that one of ordinary skill in the art following the teachings of the two cited patents would not be led to construct
10 the three-layered sandwich structure present in applicants' claim 1 and, by claim dependency, incorporated into applicants' other claims. It is therefore respectfully requested that the rejection of applicants' claims 1-6 be withdrawn.

With specific attention now being directed to the Examiner's
15 comments concerning claim 4, it is noted that while it might be conceded, solely for the sake of argument, that a combination of cited art which teaches that a circuit board would include electrical connectors, it is nonetheless absolutely clear that these connectors would not extend through apertures in a
20 stiffening structure. In particular, this is true because the stiffener in Lajara et al. is disposed on the bottom, lower, or second side of their printed circuit board.

With respect to the Examiner's comments concerning claim 5, it is noted that applicants' guides are structures which are
25 distinct from electrical connectors. In applicants' description, electrical connectors are not considered to be guides. This is apart from the fact that electrical connecting structures are provided with shapes that are intended to facilitate card level insertion for electrical connection, similar to what a guide
30 might do. However, in applicants' claimed invention, the recited guides are different structures than electrical connectors and

are intended for mechanical connection of cartridge devices and are not intended to immediately create an electrical connection. Furthermore, the location and orientation of these guides are significantly different than any guide structure associated with an electrical connector. In this regard, it is further noted that applicants have included a non-limiting whereby clause in claim 5 which more readily helps to point out the function of the recited guide structures.

With respect to the Examiner's comments concerning claim 6, it is noted that this claim has been amended herein in a way in which renders the Examiner's comments moot.

Accordingly, it is now seen that all of the applicants' claims are in condition for allowance. Therefore, early notification of the allowability of applicants' claims is earnestly solicited. Furthermore, if there are any matters which the Examiner feels could be expeditiously considered and which would forward the prosecution of the instant application, applicants' attorney wishes to indicate his willingness to engage in any telephonic communication in furtherance of this objective. Accordingly, applicants' attorney may be reached for this purpose at the numbers provided below.

RESPECTFULLY SUBMITTED

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Date

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